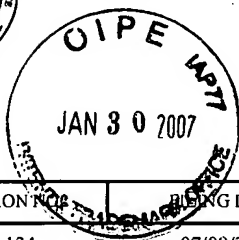




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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,134	07/08/2003	Waldemar Brinkis	502901-155	8115

7590 01/22/2007  
COHEN, PONTANI, LIEBERMAN & PAVANE  
Suite 1210  
555 Fifth Avenue  
New York, NY 10176

EXAMINER
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RODELA, EDUARDO A

ART UNIT	PAPER NUMBER
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2826

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/22/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/615,134		BRINKIS ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Eduardo A. Rodela		2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 November 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 13-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

*Minhloan Tran*  
**Minhloan Tran**  
**Primary Examiner**  
**Art Unit 2826**

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date: _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/8/03</u>  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

This Office Action is in response to the Election response filed November 13, 2006. Group I (claims 1-12) has been elected.

#### ***Information Disclosure Statement***

The information disclosure statement filed July 8, 2003 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because several foreign patent documents referenced have not been translated to English. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

#### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the plurality of power and/or electronic components of claims 1, 7, 8-10, and 12 (also the details of the stacked orientation of this claim), must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended

replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mattman et al. (EP 1 249 869) in view of Asai et al. (US 4,521,476) and Liederbach (US 3,714,709).

Regarding claim 1, Mattmann shows an electronics unit, comprising:

a low multi-point metallic mount [1];

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an insulating layer [2] arranged on said mount;

a conductor track system [4,5,6,7, which is a thick film type conductor, see English abstract] on said insulating layer [2]; and

electronic power components [9, it is well known to use several power devices in a single circuit or system, see elements 66 of Figure 14 of Morita et al. (US 2002/0074651)] arranged on said conductor track system [4,5,6,7]. Mattmann does not show an insulating layer comprises a sintered electrically insulating polymer layer and also does not specify the conductor track system is comprised of a sintered glass frit with a noble metal filling. Asai shows (e.g. Figures 5-8) an insulating layer comprises a sintered [it is well known in the art that epoxies are cured by the application of heat, see line 7 of paragraph 0030 of Sakamoto et al. (US 2002/0020554)] electrically insulating polymer layer [1, which is used to connect conductor tracks 3' to metal base 8]. Asai teaches the benefits of having an insulating layer which is comprised of a sintered electrically insulating polymer layer as a material which can be used to permit high heat conductivity [column 2: line 60 to column 3: line 4]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the insulating layer comprising a sintered electrically insulating polymer layer arranged on said mount in the invention of Mattman as suggested by Asai because the insulating layer can be used to permit high heat conductivity. Liederbach shows an electronic system which has a conductor track system [4,6,8,10,12,14] is comprised of a sintered glass frit with a noble metal filling [column 3: lines 8-31]. Liederbach teaches the benefit of using a conductor track system is comprised of a sintered glass frit with a noble metal filling to

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allow for screen printing pattern transfer [column 2: lines 55-65]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the conductor track system is comprised of a sintered glass frit with a noble metal filling in the invention of Mattmann as suggested by Liederbach to allow for screen printing pattern transfer.

Regarding claim 2, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. Liederbach, wherein said noble metal filling comprises one of a silver filling and a filling containing silver [column 3: lines 8-31].

Regarding claim 3, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Liederbach shows wherein said glass frit is a low melting-point glass frit [shows the use of borosilicate glass frit, column 3: lines 22-27, which is well known to be a low melting point glass, see column 7: lines 18-27 of Pryor et al. (US 4,821,151)].

Regarding claim 4, Mattmann in view of Asai and Liederbach show the electronics unit of claim 2. In addition, Liederbach shows wherein said glass frit is a low melting-point glass frit [shows the use of borosilicate glass frit, column 3: lines 22-27, which is well known to be a low melting point glass, see column 7: lines 18-27 of Pryor et al. (US 4,821,151)].

Regarding claim 5, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Mattmann shows wherein said mount [1] is

made of a material from the group consisting of aluminum and an aluminum alloy [see English abstract].

Regarding claim 6, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Mattmann shows wherein said mount [1] comprises cooling ribs [protrusions on bottom surface].

Regarding claim 7, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Mattmann shows wherein said power components [3] comprise at least one of power semiconductor elements and driver components [see English abstract].

Regarding claim 8, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Mattmann shows comprising at least one of electrical and electronic components [9] arranged on the conductor track system [between 6 and 7].

Regarding claim 9, Mattmann in view of Asai and Liederbach show the electronics unit of claim 8. In addition, Mattmann shows wherein said power components [3] and said at least one of electrical and electronic components [9] are conductively connected to the conductor track system by bonding [both are bonded to conductor tracks 4,6,7].

Regarding claim 10, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Mattmann shows wherein said power components [3] and said at least one of electrical and electronic components [9] are

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conductively connected to the conductor track system by bonding [both are bonded to conductor tracks 4,6,7].

Regarding claim 11, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. In addition, Asai shows wherein said electrically insulating polymer layer [1] has a thickness of about >20 um [column 4: lines 52-55].

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mattman et al. (EP 1 249 869) in view of Asai et al. (US 4,521,476) and Liederbach (US 3,714,709) in further view of Akram (US 6,417,027).

Regarding claim 12, Mattmann in view of Asai and Liederbach show the electronics unit of claim 1. Mattmann, Asai, and Liederbach do not show:

a further insulating layer comprising a sintered polymer arranged on said conductor track system and on said electronic power components; a further conductor track system comprising a sintered glass frit with noble metal filling arranged on said further insulating layer; and further electronic power components arranged on said further conductor track system. Akram shows (e.g. Figures 1-4 and 8) a further insulating layer comprising a sintered polymer [insulator portion of 12, column 4: lines 23-35, uses polyimide, which is well known as a thermosetting material, see column 9: lines 24-29 of Meissner et al. (US 5,264,326)] arranged on a conductor track system [25] and on electronic power components [14]; a further conductor track system [portion of 12, made of conductive polymer thick film, column 4: lines 46-52]; and

further electronic power components [14, column 4: lines 15-25] arranged on said further conductor track system [12]. Akram teaches the benefits of stacking insulators,

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conductor tracks, and extra devices to facilitate high density stacking of semiconductor devices [column 1: lines 15-18] as suggested by Akram. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the further insulating layer comprising a sintered polymer arranged on said conductor track system and on said electronic power components; a further conductor track system arranged on said further insulating layer; and further electronic power components arranged on said further conductor track system in the invention of Mattmann in view of Asai and Liederbach as suggested by Akram in order to facilitate high density stacking of semiconductor devices. Akram does not show the specific constituents of the polymer thick film conductor track system. However, Liederbach discloses that sintered glass frit with a noble metal filling is a known material for conductive polymer thick films. The applicant is reminded in this regard that it has been held that mere selection of known materials generally understood to be suitable to make a device, the selection of the particular material being on the basis of suitability for the intended use, would be entirely obvious. In re Leshin 125 USPQ 416.

***Fax / Telephone Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo A. Rodela whose telephone number is (571) 272-8797. The examiner can normally be reached on M-F, 9:00AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2826

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Eduardo A. Rodela  
Examiner

E.R.

Substitute for Form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)	<b>Complete if Known</b>	
	Application Number	10/615134
	Filing Date	7/8/03
	First Named Inventor	Waldemar BRINKIS
	Art Unit	2826
	Examiner Name	Rodela, E.
	Attorney Docket Number	502901-155
Sheet 1 of 2		

[illegible]

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>o</sup>
		Country Code* Number* Kind-Code <sup>3</sup> (if known)				
ER	AD	GB 1 210 175	10/1970			
	AE	DE 41 29 835	3/1993			Abstract
	AF	DE 44 27 112	2/1996			Abstract
	AG	DE 197 00 963	7/1998			
	AH	DE 690 22 130 T2	3/1996			
	AI	1 704 881	5/1971			
	AJ	2002097069 A	4/2002			Abstract

**Examiner  
Signature**

/Eduardo Rodela/

**Date Considered**

12/14/2006

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* Applicant's unique citation designation number (optional). \* See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. \* Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). \* For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. \* Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. \* Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

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Substitute for Form 1449/PTO		<b>Complete if Known</b>	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)		Application Number	10/615134
		Filing Date	7/8/03
		First Named Inventor	Waldemar BRINKIS
		Art Unit	2826
		Examiner Name	Rodela, E.
Sheet 2 of 2	Attorney Docket Number	502901-155	

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
ER ✓	AK	Oba, T. et al. Sintering behavior of silver with various glass frits Published in: Electronic Manufacturing Technology Symposium 1995, Proceeding of 1995 Japan International, 18 <sup>th</sup> IEEE/CPMT International 5 pages 4-6 Dec. 1995	
ER /	AL	Ha, L. et al Thermal study of additive multilayer circuitry on polymer and metal substrates Published in: Management Symposium, 198. SEMI-THERM Proceeding 1998., Fourteenth Annual IEEE 8 pages 10-12 Mar. 1998	

Examiner Signature	/Eduardo Rodela/	Date Considered	12/14/2006
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* Applicant's unique citation designation number (optional). \* See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. \* Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). \* For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. \* Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. \* Applicant is to place a check mark here if English language Translation is attached.  
This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

If you need assistance in completing the form, call 1-800-PTO-9199 (1800-786-9199) and select option 2.

<b>Notice of References Cited</b>	Application/Control No. 10/615,134		Applicant(s)/Patent Under Reexamination BRINKIS ET AL.	
	Examiner Eduardo A. Rodela		Art Unit 2826	Page 1 of 1

#### U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,417,027	07-2002	Akram, Salman	438/109
*	B	US-4,521,476	06-1985	Asai et al.	428/209
*	C	US-3,714,709	02-1973	Liederbach	29/841
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

#### FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	EP 1249869 A2	10-2002	European Patent	MATTMANN et al.	
	O					
	P					
	Q					
	R					
	S					
	T					

#### NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



(11) **EP 1 249 869 A2**

(12) **EUROPÄISCHE PATENTANMELDUNG**

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**16.10.2002 Patentblatt 2002/42**

(51) Int Cl.7: **H01L 23/373**

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(71) Anmelder: **SIEMENS AKTIENGESELLSCHAFT**  
**80333 München (DE)**

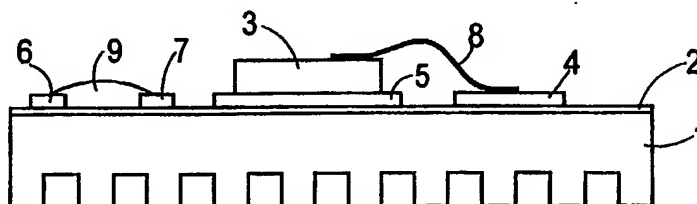
(72) Erfinder:  
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**55262 Heidesheim (DE)**  
 • **Thyzel, Bernd**  
**61479 Schlossborn (DE)**

(30) Priorität: **12.04.2001 DE 10118384**

(54) **Anordnung zur Kühlung eines Leistungs-Halbleiterelementes**

(57) Bei einer Anordnung zur Kühlung eines Leistungs-Halbleiterelementes ist vorgesehen, daß auf einem Aluminiumträger eine Isolierschicht aus kerami-

schem Werkstoff aufgebracht ist, auf welcher das Leistungs-Halbleiterelement angeordnet ist. Die Isolierschicht kann mit einem plasmachemischen Verfahren aufgebracht sein.



**EP 1 249 869 A2**

## Beschreibung

Anordnung zur Kühlung eines Leistungs-Halbleiterelementes

[0001] Die Erfindung betrifft eine Anordnung zur Kühlung eines Leistungs-Halbleiterelementes.

[0002] Zur Ableitung der in Leistungs-Halbleiterelementen entstehenden Wärme werden meist Kühlkörper aus Aluminium verwendet. Dazu ist eine gut wärmeleitende Verbindung zwischen dem Leistungs-Halbleiterelement und dem Kühlkörper erforderlich, wobei in der Regel zusätzlich eine elektrische Isolierung benötigt wird. Um den Wärmewiderstand zwischen dem Leistungs-Halbleiterelement und dem Kühlkörper möglichst gering zu halten, sind verschiedene Pasten und Kleber, die im Bedarfsfall auch leitend sind, bekanntgeworden. Dennoch haben die Wärmeübertragungsmedien den größten Anteil am Wärmewiderstand des gesamten Aufbaus.

[0003] Aufgabe der vorliegenden Erfindung ist es, einen guten Wärmeübergang zwischen dem Leistungs-Halbleiterelement und dem Kühlkörper bei gleichzeitiger zuverlässiger elektrischer Isolierung sicherzustellen.

[0004] Diese Aufgabe wird erfindungsgemäß dadurch gelöst, daß auf einem Aluminiumträger eine Isolierschicht aus keramischem Werkstoff aufgebracht ist, auf welcher das Leistungs-Halbleiterelement angeordnet ist. Vorzugsweise ist dabei die Isolierschicht mit einem plasma-chemischen Verfahren aufgebracht. Eine Schichtstärke von vorzugsweise 5  $\mu\text{m}$  bis 30  $\mu\text{m}$  ermöglicht eine ausreichende elektrische Isolation bei einem möglichst geringen Wärmewiderstand.

[0005] Eine vorteilhafte Ausgestaltung der erfindungsgemäßen Anordnung besteht darin, daß das Leistungs-Halbleiterelement auf einer leitenden Schicht auf der Isolierschicht angeordnet ist. Die leitende Schicht kann eine übliche direkt - beispielsweise durch Siebdruck bzw. Dosieren - oder indirekt mit Abziehfolie aufgebrachte Leiterbahn sein. Zur Vervollständigung der das Leistungs-Halbleiterelement beinhaltenden Schaltung können in gleicher Weise auch weitere Leiterbahnen vorgesehen sein.

[0006] Die erfindungsgemäße Anordnung hat den Vorteil einer besseren thermischen Anbindung des Leistungs-Halbleiterelementes an den Kühlkörper und damit einer Reduzierung des Wärmewiderstandes. Es können bei gleichen Leistungsanforderungen kleinere und damit kostengünstigere Leistungs-Halbleiterelemente eingesetzt werden. Die Erfindung ermöglicht weiterhin eine Mischung zwischen Standardelektronik und Direktschicht auf Aluminium, wobei zur Verbindung Dickdrahtbonden geeignet ist.

[0007] Weitere vorteilhafte Ausgestaltungen bestehen darin, daß die leitende Schicht mit bei niedrigen Temperaturen schmelzenden Dickschichtpasten oder mit elektrisch leitfähigem Klebstoff hergestellt ist.

[0008] Die erfindungsgemäße Anordnung kann auch dahingehend weiter gebildet sein, daß auf der Isolierschicht ferner Schichtwiderstände angeordnet sind, die aus Polymer-Pasten bestehen.

5 [0009] Die Erfindung läßt zahlreiche Ausführungsformen zu. Eine davon ist schematisch in der Zeichnung dargestellt und nachfolgend beschrieben.

10 [0010] Die Zeichnung stellt das Ausführungsbeispiel schematisch dar, wobei wegen der besseren Erkennbarkeit die Schichten stärker als in Wirklichkeit dargestellt sind. Auf einem Kühlkörper 1 aus Aluminium ist eine isolierende Schicht 2 aus Keramik aufgebracht. Darauf befindet sich eine leitende Schicht in Form von Leiterbahnen 4 bis 6. Die Leiterbahn 5 trägt das Leistungs-Halbleiterelement 3, das elektrisch einerseits - vorzugsweise durch Löten - mit der Leiterbahn 5 und andererseits über einen Bonddraht 8 mit der Leiterbahn 4 verbunden ist.

15 [0011] Die weiteren Leiterbahnen 6 und 7 sind über einen Dickschichtwiderstand 9 miteinander verbunden.

## Patentansprüche

- 25 1. Anordnung zur Kühlung eines Leistungs-Halbleiterelementes,  
**dadurch gekennzeichnet, daß**  
auf einem Aluminiumträger (1) eine Isolierschicht (2) aus keramischem Werkstoff aufgebracht ist, auf welcher das Leistungs-Halbleiterelement (3) angeordnet ist.
- 30 2. Anordnung nach Anspruch 1,  
**dadurch gekennzeichnet, daß**  
die Isolierschicht (2) mit einem plasma-chemischen Verfahren aufgebracht ist.
- 35 3. Anordnung nach einem der Ansprüche 1 oder 2,  
**dadurch gekennzeichnet, daß**  
das Leistungs-Halbleiterelement (3) auf einer leitenden Schicht (5) auf der Isolierschicht (2) angeordnet ist.
- 40 4. Anordnung nach Anspruch 3,  
**dadurch gekennzeichnet, daß**  
die leitende Schicht (5) mit bei niedrigen Temperaturen schmelzenden Dickschichtpasten hergestellt ist.
- 45 5. Anordnung nach Anspruch 3,  
**dadurch gekennzeichnet, daß**  
die leitende Schicht (5) mit elektrisch leitfähigem Klebstoff hergestellt ist.
- 50 6. Anordnung nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, daß**  
auf der Isolierschicht (2) ferner Schichtwiderstände

(9) angeordnet sind, die aus Polymer-Pasten bestehen.

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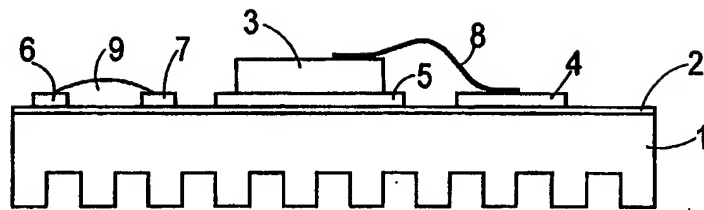
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DERWENT-ACC-NO: 2002-725147

DERWENT-WEEK: 200279

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TITLE: Cooling device for power semiconductor device  
has  
ceramic insulating layer applied to aluminum  
carrier e.g.  
by plasma-chemical technique

INVENTOR: MATTMANN, E; THYZEL, B

PATENT-ASSIGNEE: SIEMENS AG[SIEI]

PRIORITY-DATA: 2001DE-1018384 (April 12, 2001)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
PAGES MAIN-IPC		
DE 10118384 A1	October 24, 2002	N/A
000 H01L 023/36		
EP 1249869 A2	October 16, 2002	G
004 H01L 023/373		

DESIGNATED-STATES: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU  
LV MC MK  
NL PT RO SE SI TR

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO
APPL-DATE		
DE 10118384A1	N/A	2001DE-1018384
April 12, 2001		
EP 1249869A2	N/A	2002EP-0008005
April 10, 2002		

INT-CL (IPC): H01L023/36, H01L023/373 , H01L025/07 , H05K007/20

ABSTRACTED-PUB-NO: EP 1249869A

BASIC-ABSTRACT:

NOVELTY - The cooling device comprises an aluminum carrier (1) to  
which an  
insulating layer (2) made of ceramic material is applied. The power

semiconductor device (3) is arranged on the insulating layer. The insulating layer may be applied using a plasma-chemical technique. The power semiconductor device may be arranged on a conductive layer (5) on the insulating layer. The conductive layer may be made from a thick-film paste that melts at low temperatures, or from conductive adhesive. Film resistors made of polymer paste may be arranged on the insulating layer.

USE - For cooling a semiconductor device using a heat sink.

ADVANTAGE - Good heat transfer between the power semiconductor device and the heat sink, while ensuring reliable electrical insulation.

DESCRIPTION OF DRAWING(S) - The drawing shows a cross-sectional view of the device.

Aluminum carrier 1

Insulating layer 2

Power semiconductor device 3

Conductive layer 5

CHOSEN-DRAWING: Dwg.1/1

TITLE-TERMS: COOLING DEVICE POWER SEMICONDUCTOR DEVICE CERAMIC  
INSULATE LAYER

APPLY ALUMINIUM CARRY PLASMA CHEMICAL TECHNIQUE

DERWENT-CLASS: U11

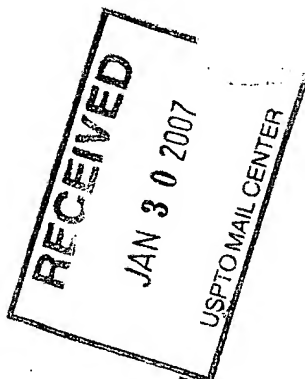
EPI-CODES: U11-D01C6; U11-D02B2;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: N2002-571810

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